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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
NGUYEN, DAO H	

ART UNIT	PAPER NUMBER
2818	

DATE MAILED: 08/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/714,243	CHEN ET AL.	
	Examiner	Art Unit	
	Dao H. Nguyen	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 May 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4,5,8-11 and 14-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 4, 5, 8-11, and 14-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in response to the communications dated 05/31/2006.

Claims 1, 4, 5, 8-11, and 14-19 are active in this application.

Claim(s) 2, 3, 6, 7, 12, 13, and 20-24 have been cancelled.

Remarks

2. Applicant's argument(s), filed 05/31/2006, have been fully considered, but are moot in view of the new ground of rejection.

Withdrawal of Allowabilities

3. The indicated allowabilities of claims 5, 8-11, 14, and 15 are withdrawn in view of the newly discovered reference(s) to Hu et al. Rejections based on the newly cited reference(s) follow.

Claim Objection

4. The claim is objected to for the following reason:

Regarding claims 9 and 15, the term "said first sidewall" (line 2) is believed to be improper in the claim combination and should be changed to --said second sidewall--. Appropriate correction is required.

Claim 17 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. It is noted that limitations of claim 17 are all included in claim 16. Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claim(s) 1, 4, 5, 8-11, and 14-19 is/are rejected under 35 U. S. C. § 102 (e) as being anticipated by U.S. Patent No. 6,952,034 to Hu et al.

The applied reference has a common Assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Regarding claim 1, Hu discloses a non-volatile memory cell, as shown in figs. 1-2, comprising:

a substantially single crystalline substrate 10 of a first conductivity type (p-type substrate; col. 5, lines 2-8) having a planar surface;

a trench 34 (fig. 2B) in said planar surface, said trench 34 having a side wall and a bottom;

a floating gate 40a (figs. 2) in said trench 34 spaced apart and insulated from said sidewall and from said bottom (by insulating material 36); said floating gate 40a having a tip 42 (col. 6, lines 59-60) away from said bottom;

a first region 52 of a second conductivity type in said bottom (col. 7, lines 25-35);

a second region 70 of a second conductivity type along said planar surface, spaced apart from said first region 52 (fig. 2Q);

a channel region 90 between said first region 52 and said second region 70, said channel region 90 along said sidewalls, said floating gate 40a spaced apart and along said entire channel region 90;

a control gate 68 capacitively coupled to said floating gate 40a and capable of effecting erase; and

a tunnel material 56 between said tip 42 and said control gate 68, wherein said tunnel material is a tunnel oxide and configured to permit Fowler-Nordheim tunneling of charges from said floating gate to said control gate (col. 9, lines 12-30 and lines 41-54).

Regarding claim 4, Hu discloses the memory cell further comprising an insulation material 36 between said floating gate 40a and said sidewall of said trench 34, said insulation material 36 permitting injection of hot channel electrons from said channel region to said floating gate. See col. 9, line 64 to col. 10, line 4.

Regarding claim 5, Hu discloses an array of non-volatile memory cells in a substantially single crystalline substrate 10 of a first conductivity type (p-type substrate; col. 5, lines 2-8) having a planar surface, as shown in figs. 1, 2, and 4, said array comprising:

a plurality of discontinuous trenches 34 in said planar surface (col. 6, lines 16-24), spaced apart and substantially parallel to one another extending in a first direction (col. 2, lines 51-59; col. 3, lines 32-40); each of said discontinuous trenches 34 having two sidewalls and a bottom and being discontinuous in said first direction by a plurality of isolations, each of said discontinuous trenches having a plurality of sections separated by an isolation;

a first (left) floating gate 40a (fig. 2Q) in each trench spaced apart and insulated from a first sidewall and from said bottom (by oxide layer 36); said first floating gate 40a having a tip 42 (col. 6, lines 59-60) away from said bottom;

a second (right) floating gate 40a in each trench spaced apart and insulated from a second sidewall and from said bottom; said second floating gate having a tip 42 away from said bottom;

a first region 52 of a second conductivity type (col. 7, lines 25-35) in said bottom of each trench;

a second region 70 of said second conductivity type along said planar surface;

a channel region 90 between each of said first region 52 and said second region 70, said channel region 90 along said first and second sidewall;

a first contact 54 in a first trench 34 electrically connected to said first region 52 of a first section and electrically connected to said first region of a second section of said first trench (col. 9, lines 6-11);

a plurality of control gates 68, each control gate 68 extending in a second direction (col. 18, lines 49-54), substantially perpendicular to said first direction, extending over a plurality of tips of a plurality of floating gates and insulated therefrom (fig. 2Q); and

a tunnel material 56 between said plurality of tips 42 and said control gate 68, wherein said tunnel material 56 is a tunnel oxide and configured to permit Fowler-Nordheim tunneling of charges from said floating gate 40a to said control gate 68 (col. 9, lines 12-30 and lines 41-54).

Regarding claim 8, Hu discloses the array further comprising an insulation material 36 between said first (left) floating gate 40a and said first sidewall of said trench 34, said insulation material 36 permitting injection of hot channel electrons from said channel region to said first floating gate. See col. 9, line 64 to col. 10, line 4.

Regarding claim 9, Hu discloses the array further comprising said insulation material 36 between said second (right) floating gate 40a and said second sidewall of said trench, said insulation material 36 permitting injection of hot channel electrons from said channel region to said second floating gate. See col. 9, line 64 to col. 10, line 4.

Regarding claim 10, Hu discloses a non-volatile memory device in a substantially single crystalline substrate 10 of a first conductivity type (p-type substrate; col. 5, lines 2-8) having a planar surface, as shown in figs. 1, 2, and 4, said device comprising:

an array of non-volatile memory cells arranged in a plurality of rows and columns (fig. 4); wherein each cell comprising:

a trench 34 in said planar surface, said trench 34 having a side wall and a bottom;

a floating gate 40a in said trench 34 spaced apart and insulated from said sidewall and from said bottom (by insulating layer 36); said floating gate 40a having a tip 42 (col. 6, lines 59-60) away from said bottom;

a first region 52 (col. 7, lines 25-35) of a second conductivity type in said

bottom;

a second region 70 of a second conductivity type along said planar surface, spaced apart from said first region 52;

a channel region 90 between said first region 52 and said second region 70, said channel region 90 along said sidewall;

a control gate 68 spaced apart from said tip 42 and capacitively coupled to said tip 42; and

a tunnel material 56 between said tip 42 and said control gate 68, wherein said tunnel material 56 is a tunnel oxide configured to permit Fowler-Nordheim tunneling of charges from said floating gate 40a to said control gate 68 (col. 9, lines 12-30 and lines 41-54); and

wherein cells in adjacent columns share a common trench 26 (fig. 4) to one side and a common second region 70 to another side;

wherein cells in adjacent rows are separated by an isolation row and wherein said second region 70 in one row is connected to said second region of another row (see figs. 2, 4);

wherein a first cell in a first row includes a first contact 54 in said trench electrically connected to said first region 52 of said first cell (col. 9, lines 6-11) and wherein said first contact 54 is electrically connected to said first region 52 of a second cell in a second row separated from said first row by at least one isolation row; and

wherein said control gate of cells in the same row are connected together (fig. 4).

Regarding claim 11, Ho discloses the device wherein a control gate 68 extends over a plurality of rows. See fig. 4.

Regarding claim 14, Hu discloses the array further comprising an insulation material 36 between said first (left) floating gate 40a and said first sidewall of said trench 34, said insulation material 36 permitting injection of hot channel electrons from said channel region to said first floating gate. See col. 9, line 64 to col. 10, line 4.

Regarding claim 15, Hu discloses the array further comprising said insulation material 36 between said second (right) floating gate 40a and said second sidewall of said trench, said insulation material 36 permitting injection of hot channel electrons from said channel region to said second floating gate. See col. 9, line 64 to col. 10, line 4.

Regarding claim 16, Ho discloses a non-volatile memory device, as shown in figs. 1, 2, and 4, comprising:

a plurality of non-volatile memory cells arranged in a plurality of rows and columns (fig. 4); each cell having a first terminal 52, in a trench 34, and second terminals 70, not in a trench, with a channel region 90 therebetween along a sidewall of the trench, a floating gate 40a spaced apart and insulated from said channel region 90 along said sidewall of the trench, a control gate 68 capacitively coupled with said floating gate 40a, and a tunnel material 56 between said floating gate 40a and said control gate 68 configured to permit Fowler-Nordheim tunneling of charges from said

floating gate 40a to said control gate to effect erasure (col. 9, lines 12-30 and lines 41-54); a coupling gate 54 capacitively coupled to the floating gate 40a and electrically connected to said first terminal 52

wherein said cells in the same row are connected with each cell having a common second terminal 70 with an adjacent cell to one side, and having a common first terminal and a common coupling gate with an adjacent cell to another side (fig. 4);

wherein cells in the same row have the control gate 68 connected together; and

wherein cells in adjacent rows are separated by isolation 26 (fig. 4).

Regarding claim 17, Ho discloses the device wherein said first terminal 52 is in a trench 34 and said second terminal 70 is not in a trench.

Regarding claim 18, Ho discloses the device wherein said floating gate of cells in the same row are capacitively coupled to the same control gate. See figs. 2, 4.

Regarding claim 19, Ho discloses the device wherein cells in the same column have the same first terminal 52 and the same second terminal 70. See figs. 2, 4.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dao Nguyen whose telephone number is (571)272-1791. The examiner can normally be reached on Monday-Friday 9:00am - 6:00pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached on (571)272-1907. The fax numbers for all communication(s) is (571)273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571)272-1625.

DOUGLAS W. OWENS
PRIMARY EXAMINER

Dao H. Nguyen
Art Unit 2818
July 26, 2006